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SCIENCE NEWS LETTER

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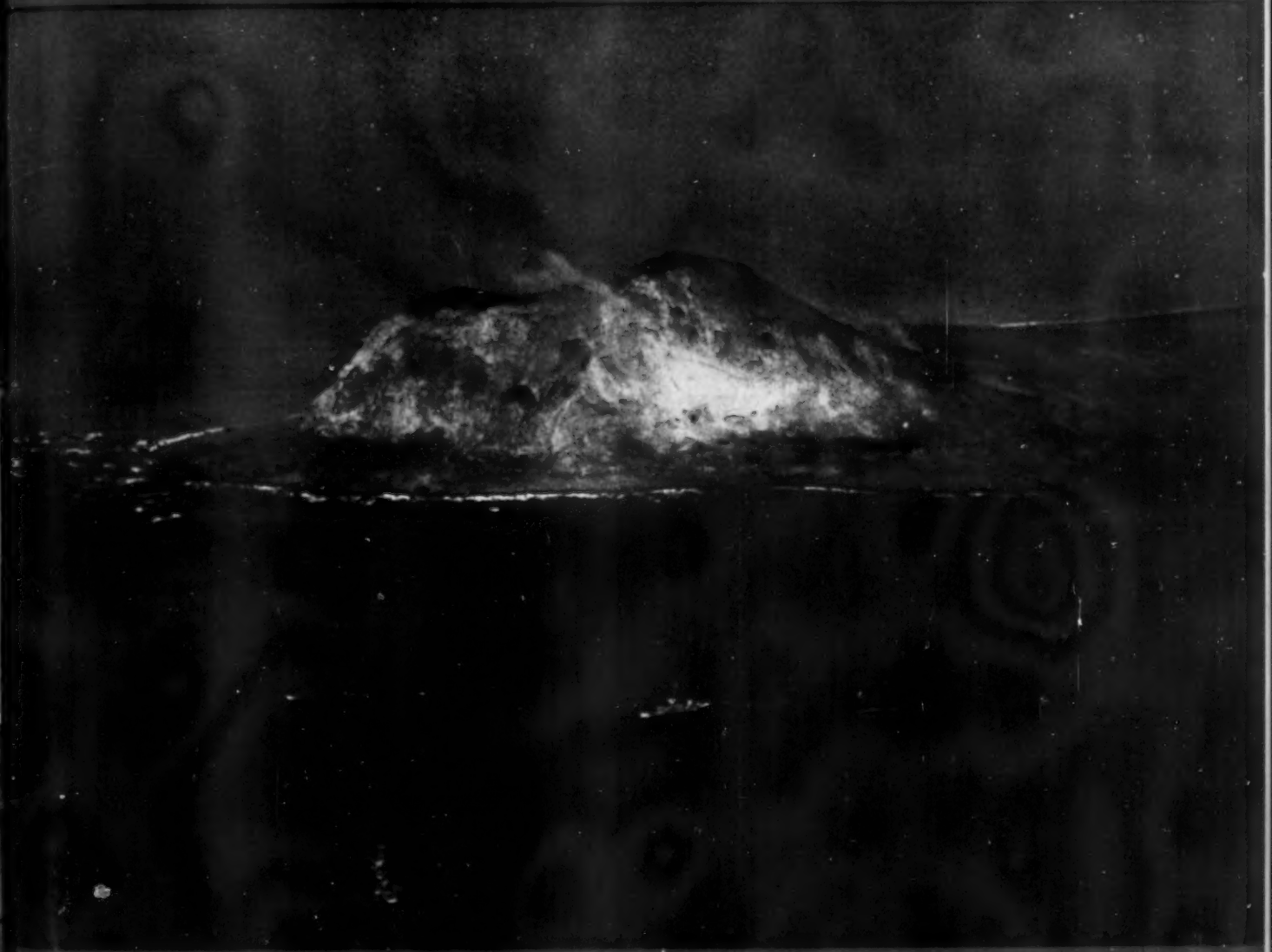
THE WEEKLY SUMMARY OF CURRENT SCIENCE • MARCH 31, 1945



Iwo Jima

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A SCIENCE SERVICE PUBLICATION

CHEMISTRY

Resins Purify Water

Sugar solutions, chemicals and pharmaceutical products are freed of inorganic salts by passing through ion-exchange synthetics.

➤ WATER is now freed of undesirable mineral salts by filtration through specially-prepared synthetic resins and purified to a degree where it is nearly equivalent to distilled water in quality, and may be used in place of distilled water in many chemical processes, declared Dr. Robert J. Myers, of the Resinous Products and Chemical Company, Philadelphia, in a lecture at Western Reserve University. Sugar solutions, chemicals, and pharmaceutical products may be purified of inorganic salts by the same method, he said.

This modern method of producing water and chemical solutions free of inorganic salts consists in passing them through two beds of the special resins known as ion-exchange resins. The ion-exchange synthetic resins are of two kinds, he explained, a cation-exchanging type and an anion-exchanging type. The first will exchange sodium for calcium and magnesium ions, the latter two being the hardness-producing ions in water supplies, and the water is thereby softened. When the store of sodium ions in the resins is exhausted, the calcium and magnesium ions which have been captured by the resin during the softening process are flushed off by the use of strong salt solutions and the rejuvenated resin is again ready for use.

"In a similar manner the same resins can be used as a storehouse of hydrogen ions," the speaker continued, "by treatment of the resin with a mineral acid, and the hardness-producing as well as the alkali-ions of water may be displaced by hydrogen ions."

Sodium bicarbonate alkalinity is converted to carbonic acid, and mineral salts, such as sodium sulfate, are converted to the free acids by the use of the hydrogen exchanger.

"The anion-exchanger resin is a similar gel-like substance which contains basic groups, such as amino, which bind mineral acids when placed into contact with acid solutions," Dr. Myers explained. "When the effluent from a hydrogen exchanger bed is passed through a bed of granulated, anion-exchanger resin, the free mineral acids generated in the first bed are bound by the second bed, and water free of all mineral salts emerges from the second bed."

Such "de-ionized" water is nearly equivalent to distilled water in quality and can be produced at a fraction of the cost, he added.

Water, de-ionized by this process, is being used in the manufacture of synthetic rubber, pharmaceuticals, plastics in ceramics and metallurgy, he stated. Specific processes for the removal of dissolved salts from molasses, formaldehyde solutions, and sugar syrups, and other purposes, have been developed. Organic chemical synthesis, Dr. Myers said, has been combined with colloid chemistry in the development of the synthetic resin exchange adsorbents.

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CHEMISTRY

Color Detectives Speed Chemical Analysis

➤ COLOR detectives that simplify and speed up the chemical analysis of such substances as milk, metals, beer, wine and soap have been perfected in stable form at the University of Illinois. The detectives are chemical reagents that have long been known in chemical laboratories, but because of difficulties involved in compounding them have not heretofore been looked upon as stable and positive tools of chemical analysis.

Chemically the reagents are known as ortho-phenanthrolines. They are so efficient that they are able to disclose the presence of one part of iron, or certain other elements, in a million parts of water. The new development at the university chemical laboratory is a process of producing the reagents as stable compounds capable of giving reliable reaction. Their use will permit an industrial chemist to make in 15 minutes a certain analysis that under old methods might take a half day.

Phenanthrolines have the property of combining with electrically charged atoms known as ions. Their affinity for metallic ions is so great, according to G. Frederick Smith of the University chemical staff, that three molecules of one of these compounds will combine with one ion of iron, producing an intensely red water-soluble compound.

The reagent also has an affinity for copper, nickel, chromium, cobalt, zinc and other metals, and with it the presence of these metals in water, or in alloys, or in food products, can be detected.

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TRANSPORT LINE—From this typical well thousands of cubic feet of natural gas bearing helium have been removed for processing at the Amarillo plant. Completion of the 32-mile line from Exell, Texas, opens the way for utilizing the Cliffside field as a natural reservoir for storing helium not required immediately by the military and government agencies or by commercial and scientific users.

AERONAUTICS

Engine and Propeller Mounted Separately

➤ A NOVEL way of mounting airplane engine and propeller units is covered by patent 2,371,872, granted to Frank W. Caldwell and Erle Martin of West Hartford, Conn. By mounting engine and propeller separately, each in its own housing, and connecting them with a flexible shaft, two advantages are gained. Most of the troublesome vibration that occurs when engine and propeller are rigidly connected is eliminated; and it becomes possible to remove either engine or propeller for repairs or replacement without disturbing the other.

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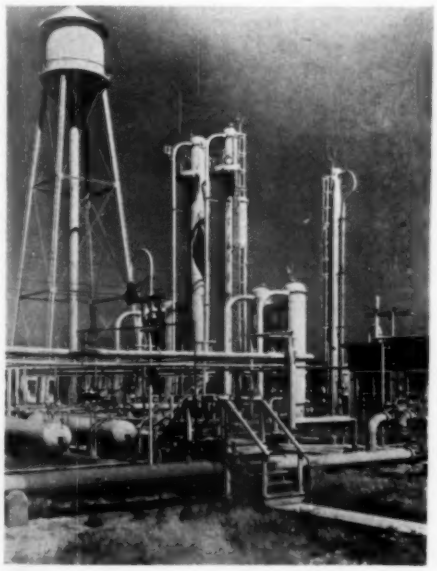
PHOTOGRAPHY

8,000 Pictures a Second

New high-speed motion picture cameras help engineers to see the rapid, complicated movements of their machines "magnified" in slow motion.

➤ NEW HIGH-SPEED motion picture cameras that will take as many as 8,000 pictures in one second help engineers to see the rapid, complicated movements of their machines "magnified" in slow motion, reported Dr. H. J. Smith, of Bell Telephone Laboratories, at a meeting of the American Society of Mechanical Engineers.

Three new high-speed cameras, developed by Western Electric, use a method of optical compensation to take their pictures. They differ mainly in that they are built to employ different widths of film. The eight-millimeter camera takes 8,000 pictures in one second. The film is the same as used in "double-eight" home movie cameras, Mr. Smith pointed out.



HELIUM EXTRACTION—This imposing array of pipes and towers at the carbon dioxide removal plant represents an important phase at the Bureau of Mines helium plant at Exell, Texas. The plant is the point of origin for a new 2-inch line which permits direct pipe line transportation of helium to the Bureau's Amarillo, Texas, extraction plant or to the Cliffside natural gas field where an underground helium "warehouse" has been established. (See SNL Mar. 17.)

The exposure time for these pictures is 33 microseconds, and when projected in a standard eight-millimeter movie projector, the pictures are slowed down in the ratio 500 to 1. (A microsecond is a thousandth of a second.)

The 16-millimeter camera, Dr. Smith stated, takes up to 4,000 pictures per second, each picture receiving an exposure of about 83 microseconds. The camera weighs only 35 pounds. By the simple expedient of photographing the action at 4,000 pictures a second, and projecting the pictures at 16 pictures a second on any standard projector, the action that was photographed will be retarded or "magnified" by the ratio of these two speeds, or 250 to 1.

Just recently the Bell Telephone Laboratories has developed a wide angle, 35-millimeter high-speed camera that will take up to 3,500 pictures a second on professional size movie film. Designed primarily for high speed studies encountered in aeronautical and ballistic research, the camera takes a picture with a field of view up to an angle of 40 degrees. This is equal to a 71-foot field of view at a distance from subject to camera of only 100 feet, Dr. Smith declared.

The optical compensation method of high speed photography used in these three cameras, which are sold under the trade name "Fastax," uses a rotating compensating glass prism placed between the lens and the film in the camera, Dr. Smith explained. In the 16 millimeter camera the prism is shaped like a cube, having two pairs of parallel glass faces. This prism is placed inside a housing having four apertures which rotates around the prism. This acts like a barrel-type shutter. The film moves continuously past the picture aperture and four pictures are exposed during each revolution of the prism. The exposure time is controlled by the speed of rotation of the prism housing.

The eight-millimeter camera employs an octagonal shaped prism, having four pairs of faces. The 35-millimeter camera employs a four-faced prism like that used in the 16-millimeter camera, Dr. Smith stated.

The high speed camera used to make slow motion pictures of prizefights, athletic events and horse races seldom run above 128 pictures a second, Dr. Smith advised.

Lighting the subject must be given careful consideration when taking high-speed pictures, Dr. Smith pointed out. Generally speaking, the amount of light required will be in direct proportion to the speed with which the pictures are taken. Thus, about 500 times as much light is needed to take pictures at 8,000 a second as at 16 a second. With a camera operating at 1,000 pictures a second, photo-flood lamps may be used. Pictures can also be taken outdoors in bright sunlight at this speed.

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MILITARY SCIENCE

Navy Task Force Lands Fifth Amphibious Corps

See Front Cover

➤ LAUNCHING the Marines in the grimmest battle in a long history of grim battles, ships of a giant Navy Task Force land members of the Fifth Amphibious Corps on Iwo Jima on Feb. 19, as shown in the U. S. Navy photograph on the front cover of this SCIENCE NEWS LETTER.

The pattern is historic; following an obliterating aerial and surface bombardment Marines swarm ashore—to find the Japs have emerged from their well-nigh invulnerable pillboxes and caves to put up a fanatic defense. Battle smoke blurs Navy ships and their targets ashore as the Task Force supports the landing with seaborne artillery.

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CHEMISTRY

Continuous-Flow Process For Alcohol Production

➤ A CUBAN inventor, Francisco Alzola of Havana, has received patent 2,371,208 on a continuous-flow process for the production of industrial alcohol, with which he proposes to replace the traditional batch process. His apparatus consists of a series of vats or tanks, into the first of which he introduces the mash of molasses or other carbohydrate, together with the necessary yeast. As fermentation proceeds, the working mash is passed from vat to vat, until maximum alcohol concentration is reached in the last one, when it is withdrawn for distillation.

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ELECTRONICS

Radar for Safety

Experimentation is aimed at the perfection of two devices, one for airport use, and the other, a collision warning device, for use in the plane itself.

► RADAR will help to make postwar air travel even more safe as the result of research started by the Civil Aeronautics Administration, which is expected to increase the safety factors of flying in fog, snow, rain or when the ground is obscured by clouds, called "instrument weather" by pilots.

Experimentation now under way at the CAA Experimental Station at Indianapolis is aimed at the perfection of two radar devices, one for airport use, and the other, a collision warning device, for use in the airplane itself. About 10 carloads of radar equipment has been loaned to the CAA for this research.

A radar tower controller for airports will permit the control tower operators to visualize on a screen the actual positions of all aircraft within a radius of about 25 miles. This would detect immediately any hazardous condition that might occur because of pilot's error, or some mechanical failure in the radio landing system. The operator could adjust the control of outbound traffic at a fogbound airfield with complete knowledge of the exact position of all incoming planes. Today, the only way an operator can determine the position of planes near his field is through position reports which are radioed in by pilots. Only one of these pilots' reports can be handled at a time, and the estimates are not always accurate.

The collision warning device is designed to be mounted on the instrument panel of the airplane. Not just another gadget to clutter up the already jammed instrument boards in most planes, the radar screen will be extremely valuable. It will report to the pilot his position in the air relative to other aircraft, and to obstacles in his path, such as radio towers, beacons, water towers and similar objects that may be hidden from his sight when the ceiling is low.

In actual operation of the collision radar instrument, pilots would be responsible for maintaining the proper distance from other aircraft while climbing to assigned altitudes, and while approaching an airport for a landing. The complete landing approach could be handled by the pilot with the control tower acting as a monitoring agent through its radar screen. This would speed up landings and take-offs in bad weather.

A radar collision warning device was developed several years ago by the CAA, but it was too heavy and too expensive for general use. Wartime demands have speeded up the refinement and practical application of this device.

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AERONAUTICS

Auxiliary Wing Tanks Carry Men, Medicine

► HOBOES who believed their traveling was forever limited to bumming rides on the undercarriages of freight trains have a chance to hitch-hike through the sky in cargo cocoons slung under the wings of Army Air Force fighter planes, it appears from a report in the magazine, *Air Force,* (March).

Although they look like giant-size cocoons mounted under the wings of a P-38 Lightning fighter plane, they are actually auxiliary wing tanks specially fitted to carry human beings comfortably, or medicines, repair parts, ammunition and supplies. In the Pacific and China-Burma-India theaters wounded men have been carried to rear bases in makeshift tanks of a similar type. Each tank has an 1,800-pound capacity.

When men are to be carried, the tanks are modified by inserting a mattress for comfort, a clear plastic nose and a tail cone which can be jettisoned so the occupant can get out in an emergency and easily parachute to earth. An intercommunications system links the pilot of the fighter with his passengers under each wing.

To prove the reliability of carrying personnel, Chief Warrant Officer George L. Singleton emerged from a wing tank cocoon at 7,000 feet while the plane was flying at 170 miles an hour and parachuted to earth.

Enough supplies can be carried to fly operational missions lasting several weeks. Each cocoon tank will hold enough mechanical supplies for minor repairs of an entire squadron of planes for five days plus enough ammunition for more than three days as well as four extra machine guns and enough food rations for 24 men for three and a half days.

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Asbestos, used extensively in the United States, is obtained principally from Canada, although some is mined in this country and some is obtained from Africa, India, Australia and Russia.

Two pounds of flaked *calcium chloride* added to a bag of cement used in making concrete gives a mixture that is risk-free from freezing and permits concrete construction during cold weather.

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ELECTRONICS

Bombers Get Gadgets

Brushes for electrical generators permit the B-17's to fly indefinitely at altitudes above 30,000 feet, where previously they lasted a few hours.

➤ THE SUCCESS of our Flying Fortresses and Superfortresses is due in large part to the new electrical gadgets that help them to fly, bomb, fight and live to fight another day. One of these developments provides brushes for electrical generators, permitting the B-17's to fly indefinitely at altitudes above 30,000 feet. Before the development of these brushes, the generators were not expected to last more than two to three hours at such altitudes.

In the development of the new generator brushes, and other devices, a young civilian engineer, George W. Sherman III, chief of the Direct Power Unit, and Col. Ted Holliday, chief of the Electrical Branch, have played an important part at the Equipment Laboratory of the Air Technical Service Command, where the work has been carried on.

Every pound that an engineer can save in equipment aboard a plane means that one more pound of military punch can be added in bombs and bullets, since weight is a factor of prime importance aboard airplanes. Through careful design, these engineers have built electrical generators for the B-29 that save 300 pounds of weight. A .50-caliber cartridge weighs four ounces, so that 300 pounds saved means 1,200 additional rounds for the gunners. At the same time these electrical generators have been increased in power over those in the first B-17 by 1,200%, with only a 50% increase in weight and almost no increase in size. There are six low-voltage direct current generators on every B-29; each delivers 54 kilowatts, which is about 70 horsepower. By comparison, you run your refrigerator on one-sixth horsepower and your radio on one-seventh horsepower.

In today's big bombers electrical systems perform literally hundreds of jobs. The B-17 contains 11 miles of wiring; and the B-29 has about 75,000 feet of wire strung throughout the fuselage and in equipment. There are about 150 electrical motors in a Superfortress.

In a combat mission aboard a big bomber, this is what electricity does: It starts the engines, changes the propeller pitch, raises and lowers the landing gear, opens and closes the bomb bay doors, manipulates the flaps and brakes, runs the bombsights, releases the bombs, turns the gun turrets, computes the gunners' sights, fires the guns, by radar waves detects and identifies ground units, and provides light and heat for the air crewmen.

The huge airplanes of the not too distant future are still military secrets, but some idea of their size can be gained from the statement of Mr. Sherman, "They will be plenty large, in view of the fact that we have to increase the 30-volt direct current system to 120 volts in order to meet the electrical demands of the new aerial battleships."

To go along with the complicated B-29 electrical system, an electrical repair shop has been developed which is now being used in India and on Saipan to maintain the Superfortresses striking at Tokio. One of the problems confronting repairmen is the fact that electrical motor armatures grow beards of fungus in tropical areas. In addition to equipment for the repair and testing of all electrical units on the B-29's, repairmen now receive instructions on how to prevent the growth of fungus on vital equipment parts through the use of special anti-fungus powders and sprays.

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METALLURGY

Magnetic Separation of Pure Iron Particles

➤ A HARVARD faculty member, Prof. John Wulff, offers a method for magnetic separation of pure iron particles from those containing carbon, as subject of patent 2,371,665. Purest possible iron is needed in powder metallurgy; too high a carbon content interferes with proper sintering.

Prof. Wulff's process depends on the fact that at a certain critical temperature carbon-containing iron becomes much less magnetic than pure iron. Heated to this temperature, the finely powdered iron is flowed over a magnetic separator. The pure iron particles stick, while the carbon-contaminated ones fall off.

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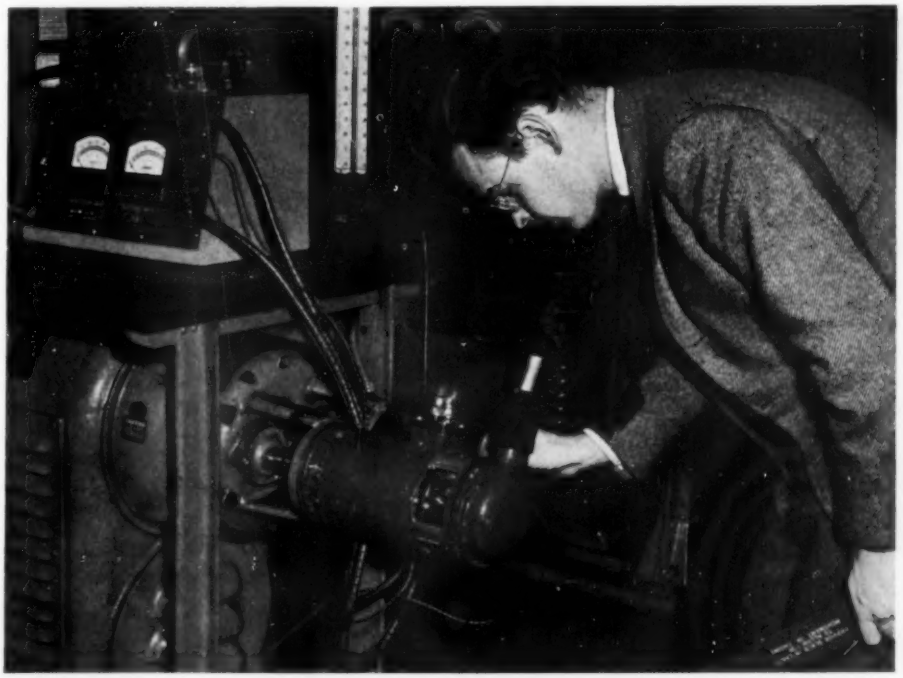

NEW GENERATOR—The secret of its ability to continue operating at extreme altitudes lies in the efficient brush design. George W. Sherman, who spent more than 50 hours flying at high altitudes working on the problem of developing long-wearing generator brushes, is shown examining the modern high flying aircraft generator.

PUBLIC HEALTH

Medical Care for Veterans

The Senate subcommittee urges extension of present facilities so returning servicemen and their families will not lack adequate care.

➤ EXPANSION and development of present community health and medical facilities so that the 15,000,000 returning veterans of this war and their families will not lack adequate care is recommended by the Senate subcommittee on wartime health and education in an interim report released recently.

Members of the subcommittee are Senators Claude Pepper, Fla., chairman, James M. Tunnell, Del., Elbert D. Thomas, Utah, Robert M. LaFollette, Jr., Wis., and H. Alexander Smith, New Jersey.

Because the quality of service given by the Veterans' Administration has been criticized, the subcommittee "proposes to ascertain the facts" through a study to be made at once with the help of medical authorities, veterans' organizations and professional groups.

"The least we can do for the battle-scarred veteran is to assure him any medical care he may need," the report declares.

Even with the planned expansion of the Veterans' Administration facilities to 300,000 beds ultimately, the Administration will not be able to assure adequate medical care in its own facilities for the 13,000,000 or more veterans who will not have injuries sustained in the service and for their families.

"The problem must be dealt with as part of the larger problem of assuring adequate medical care in every community," the subcommittee states.

In the postwar period, veterans of this and previous wars plus their families will comprise one-third to one-half of our whole population, the report points out.

"Therefore the concern which we have for medical care of veterans arises not only from an obligation to protect the future welfare of our fighting men and women," the report states, "but also from the practical necessity of maintaining and improving the health of the whole people."

The report recommends that any veteran who has a service-connected disability should be assured hospitalization and out-patient treatment, not only for his service-connected disability, but also for any other disability from which he may suffer. There is no such assurance in the present law. Responsibility for full medical care of veterans having any disabilities connected with service should be given to the Veterans' Administration, the report states, adding that such veterans will probably number from 1,500,000 to 2,500,000, depending upon how long the war lasts.

"It should be made clear," the report states, "that the subcommittee does not advocate any restriction on the responsibility which the Congress has placed on Veterans' Administration, nor on medical services now assured to veterans. On the contrary, it believes that the responsibility of the Veterans' Administration should include full care of all having service-connected disabilities.

"It believes also that the Administration should continue to have the authority which it now possesses to admit for hospital care any veteran in need of such care, when facilities are available and when he is unable to pay for hospitalization. This provision is a necessary safeguard because of inadequate community facilities at the present time, although it can never be a satisfactory alternative to community hospital programs for all veterans."

Special emphasis is given in the report to the need for developing psychiatric services for veterans who do not require hospitalization for mental conditions.

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GEOLOGY

Abundant Gasoline Supply

➤ THE UNITED States has a potential source for an abundant supply of gasoline for its future industrial development, declares F. B. Plummer, University of Texas geologist, (*Mining and Metallurgy*, Feb.). This source includes the securing of new petroleum reserves here and abroad, and the manufacture of gasoline from coal, lignite, shale and natural gas.

As for new oil developments, Mr. Plummer mentions that the West Edmond pool in Oklahoma and the expansion of new discoveries in southern Mississippi during the past year signify that large supplies are still to be found in the United States.

"The difficulty of locating pools like the East Texas pool and West Edmond pool in Oklahoma by ordinary geological or geophysical work," he says, "suggests that more intensive subsurface engineering and geological work is necessary—a search for every major buried ridge, a detailed study of the subsurface stratigraphy, development of cheaper coring methods for locating petroliferous strata and courage to test the favorable pinched out sands at the most promising spots."

Large pools may be found by such methods in foreign countries, he states, where up to now geological and geophysical work has concentrated on the location of anticlines and domes and few attempts have been made to locate pools of the East Texas type.

"Undoubtedly, many stratigraphic traps adjacent to the larger oceanic islands, the Philippines, the Netherlands Indies, and the West Indies are filled with oil," Mr. Plummer points out. "Some of these chains of islands are simply ridges partly buried beneath overlapping sediments of the present seas. The subsurface strata contain rich source beds and probably oil pools exist along their borders."

In discussing the possibilities of developing fuel from oil shale, coal, lignite, and agricultural and forestry products, Mr. Plummer says that oil shale is known to occur in quantity in 18 states and contains some 90,000,000,000 barrels of recoverable oil. Oil is now being obtained from shale in Scotland, Germany, Russia, France, Sweden, Australia, Manchuria and Japan. In Sweden a new method has been devised for the direct extraction of oil from shale beds by electrical heating.

Successful oil production from coal and lignite is reviewed by Mr. Plummer. He refers also to the extensive search being carried on by the U. S. Bureau of Mines in the hydrogenation and liquefaction of these products in this country.

"The experiments," he says, "covered a wide range of rank of coals, including peat, brown coal, lignite, subbituminous and bituminous coal, and lead to the conclusion that hydrogenation under optimum conditions results in high liquefaction yield."

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ELECTRONICS

German Tube Duplicated

In the record-breaking time of three days, American scientists duplicated a complicated radio vacuum tube left behind by the fleeing Nazis.

RADIO TUBE—This is one of the thousand tubes that were duplicated to put a German telephone system to work for our Army.

AMERICAN scientists, in the record-breaking time of three days, duplicated a complicated radio vacuum tube which had never before been made in the United States so that Yank fighting forces in Europe could make use of strategic telephone communications equipment abandoned by the Nazi armies in their retreat in Belgium and France, reports the *Bell Laboratories Record,* (March).

In retreat the Germans had left their communications equipment substantially intact, except that they removed nearly all the radio tubes. They probably thought that without the tubes we could not operate the telephone equipment and there was little chance of our being able to duplicate a strange-looking tube which we had never produced before.

But, once again, the Nazi judgment was wrong.

Our Army turned a sample tube and the problem over to an official of the Office of Scientific Research and Development. It wanted 1,000 duplicates at once. Rushed to the United States, the tube was examined by engineers of Bell Laboratories and the Western Electric Company. Included in the group were J. O. McNally, G. T. Ford, C. Depew, and W. Gronros.

The German tube was a cathode-type pentode made by Siemens Halske. It was different from any known American tube not only in electrical characteristics and in heater voltage but also in the dimensions of the bulb and base and in the arrangement of the pins which fit into the socket base. Furthermore, as is common in Europe, the bulb of the tube was sprayed with metal for purposes of electrostatic shielding.

Within three days eight replicas of the German tube were designed from available parts used in American tubes, some of which had to be adapted, and the tubes were on their way to the battle-front in Europe. Within three weeks the entire 1,000 tubes were delivered. Equipped with these tubes, the Nazi communications equipment worked.

For the part they played in designing and making the tube, Dr. Vannevar Bush, Director of OSRD, sent a special telegram of commendation to the scientists responsible.

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CARTOGRAPHY

"Handkerchief Map"

MORE MAPS than were ever needed in any other conflict are required to fight World War II, reports Lt. Col. Frederick W. Mast, executive officer of the Army Map Service. In the Normandy invasion each soldier was supplied with over 130 square feet of maps. These maps are about equal to 40 or 50 road maps of the type distributed at gasoline stations. For this one operation about 70,000,000 maps, over 3,100 different kinds, weighing 3,480 tons, were produced.

"Every branch of our fighting forces requires special maps," Col. Mast pointed out. "Our paratroopers are supplied with maps that glow in the dark, so they don't have to use lights . . . which might give them away to the enemy. Our amphibious forces have maps that show high and low water areas, cliffs, and particular beaches that are likely to be slimy and slippery at low tide."

Speaking as the guest of Watson Davis, director of Science Service, on "Adventures in Science," a CBS radio feature, Lt. Col. Mast continued, "Perhaps one of the most interesting maps is the map now found in many air-sea rescue kits. It is printed on a Celanese pocket handkerchief which is proof against salt water and sun heat."

It was pointed out by Mr. Davis that this handkerchief map has probably saved the lives of many of our men forced down at sea.

In the battle of North Africa against Field Marshal Rommel, General Wavell had special maps which showed the probable movement of sand dunes during certain seasons. The maps our troops use in the Arctic regions show caves that are good for shelter. The Quartermaster Corps has maps keyed to the clothing they should issue in any month in any part of the world.

The paper on which Army maps are printed will stand abuse in the tropics, desert, arctic, and at high altitudes, Lt. Col. Mast revealed. It can be folded 3,540 times in one place before it will tear.

In describing the tests to which the map paper was put before it was accepted, Col. Mast stated, "We ran it through a G.I. laundry with dirty clothes, then dried it. We wet it again and tacked it on the floor for people to walk over for a day. Mud, axle grease, and paint were slathered over it, and it was dipped in gasoline. Most of these tests didn't noticeably affect it."

One of the testing engineers got a little desperate in the face of the paper's indestructibility. He took a section from the map being tested and burned it. His report concluded, "Map burns easily."

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The *milkweed butterfly* secretes a disagreeable fluid to keep from being eaten by birds.

Oystershell and grit not only help the hen digest food but also help supply the calcium carbonate of which the eggshell is almost wholly composed.

PLANT PATHOLOGY

Disease of Tomato Plants From Use of Weed Killer

➤ A SAD story of ill consequences following an effort by farmers to do good in their fields is told by Dr. John T. Middleton of the California Experiment Station at Riverside, Calif. A disease of tomato plants that seemed to be a kind of mosaic appeared in certain California tomato fields. Leaves were mottled, fruits few in number and small in size. However, efforts to reproduce it by inoculating other plants with juice from diseased specimens were found to be unsuccessful.

When a check-up was made of the history of the fields in which the trouble occurred, it was learned that in every case a chemical weed-killer, sodium chlorate, had been used at some time in the past in an effort to control bindweed, one of the worst of plant pests. The more recent the treatment, the more severe were the symptoms on the tomato plants. However, effects were noted when the last application of the chlorate had been made five years previously.

Science News Letter, March 31, 1945

AERONAUTICS

British Jet Propelled Planes Are Announced

➤ THE FIRST jet-propelled plane to be used by the Allies in action against the enemy is the "Gloster Meteor," a British plane which was brought out from under the cloak of secrecy at the same time that information was released on the American P-80, "Shooting Star." It was used in France against the Germans last summer.

Although the exterior design differs from the Lockheed-built plane, the jet operation is similar, since both planes are powered by engines developed from basic designs of Air Commodore Frank Whittle. The P-80's engines are produced by General Electric, while the jet engines of the British plane are a Rolls Royce product.

The Rolls Royce engine is reported to be more efficient and have a longer life than the JUMO engine of the German Messerschmitt Me 262, the Nazis' jet plane. The engine emits no flame, as does the jet propulsion unit of the flying bomb, and in only certain rare conditions does it leave any smoke trails. The passage of a jet plane on the ground leaves in its wake the characteristic smell given off by a hot kerosene stove or a storm lantern.

Called the "Squirt" by Royal Air Force pilots, they have plenty of power, and are easy to handle at high speeds. Pilots who have flown Spitfire planes, equipped with conventional reciprocating engines, prefer the jet-propelled craft.

Science News Letter, March 31, 1945

MEDICINE

Critical Shortage Exists Of Physical Therapists

➤ MORE THAN a million dollars has been appropriated by the National Foundation for Infantile Paralysis to train physical therapists, Basil O'Connor, the foundation's president, has announced.

A "critical shortage" of qualified specialists in this field exists, he said. More than half of the nation's 2,500 physical therapists are in the armed forces, but double this number, 5,000, could be used for treating infantile paralysis victims alone, he pointed out.

Of the $1,267,600 appropriated, $1,107,000 will be for scholarships to train new physical therapists, $82,000 for fellowships to provide additional teachers, and $78,600 for general development of the field of physical therapy.

Applications for scholarships should be made to the National Foundation for Infantile Paralysis or to the American Physiotherapy Association. Applicants should be graduates in nursing, physical educators or have had two years' college training including biology and other basic sciences.

A special committee to assist in development of the new program has been formed under the chairmanship of Dr. Irvin Abell, Louisville, Ky., chairman of the board of regents of the American College of Surgeons.

Science News Letter, March 31, 1945

AGRICULTURE

Plant Patent on New Sugarcane Variety

➤ ONE LONE plant patent issued last week contrasts with 571 "regular" patents. The plant patent, No. 655, protects a new variety of sugarcane, bred by Dr. B. A. Bourne of Clewiston, Fla., who has assigned his rights to the United States Sugar Corporation. The new cane is described as heavy-stalked, rich in sugar, highly resistant to half-a-dozen plant diseases, maturing from mid-season to late.

Science News Letter, March 31, 1945

IN SCIEN

SOIL SCIENCE

Epsom Salts Useful as Horticultural Fertilizer

➤ EPSOM SALTS, old standby of the family medicine chest, can be useful as a horticultural fertilizer, reports Prof. W. L. Powers of Oregon State College (*Science*, Mar. 23).

The salts' chief value is in correcting a shortage of the essential element magnesium in certain soil types. Epsom salts, in the chemists' vocabulary, is magnesium sulfate.

In one test with the unusual fertilizer, a deficiency disease that caused blotched leaves on gooseberries was remedied. Yield of the berries was materially increased, and their content of vitamin C was found to be 24.4% higher than that of berries grown on untreated soil of the same type.

Science News Letter, March 31, 1945

CARTOGRAPHY

Coast Lines Surveyed Before Japs Surrender

➤ FOLLOWING close upon the heels of invasion forces attacking islands in the Pacific held by the Japanese, members of the Hydrographic Office and the Coast and Geodetic Survey get to work surveying coast lines, measuring the depth of waters and preparing charts of harbors for ships that may have to be brought in with supplies. This work is often carried on while bullets, shells and rockets are still whizzing through the air.

This information is vitally important to our amphibious operations, to permit the correct types of landing craft to be used, the Navy Department reports. More than 150,000 charts have been prepared for use in the theater. Charts of harbors have been issued days before a campaign was officially completed.

The chart depot is located in the Admiralty Islands under the supervision of Comdr. Lymon D. Graham, of Oakland, Calif., and Lt. C. M. Criswell, of Philadelphia, Pa. This chart depot assists in providing information regarding islands and harbors destined to be occupied by American amphibious task forces. Information gathered for charts is also transmitted to Washington, D. C., where it is disseminated.

Science News Letter, March 31, 1945

NCE FIELDS

CHEMISTRY

Compound Keeps Aviation Oil from Thickening

➤ A NEW organic chemical compound has been developed, for mixing with aviation oils in aircraft, which prevents dangerous thickening at extreme low temperatures and excessive thinning in tropical heat. Warplanes, using the mixture, can climb from desert heat to far-below-zero temperatures in the stratosphere with assurance that their mechanisms operated by hydraulic oils will continue to work, and recoil oils will function properly.

The new material, developed by the Rohm and Haas Company, is a water-white acrylic polymer, known as Acryloid HF. Acrylics are the foundation of the transparent plastic that is widely used in aviation for bomber noses, gun blisters and other plane enclosures.

Power transmission using hydraulic oils raises and lowers landing gear, operates power turrets, and controls rudders, elevators, ailerons, and even propeller pitch. The recoil oil is the shock-absorbing medium in guns of large and intermediate calibers. If the recoil oil freezes, the plane might readily be torn apart by the kick of its own guns. If the hydraulic oils thicken too much, controls and power transmission mechanism will fail to operate. These dangerous conditions will not arise, it is claimed, when the new organic compound is properly mixed with the oil.

Science News Letter, March 31, 1945

CHEMISTRY

Melting Point of Alumina Is Lower Than Supposed

➤ ALUMINA, the common oxide of aluminum which is used as an essential ingredient of super-duty spark plug insulators, high-temperature refractories, and insulators in the field of electronics, has a lower melting point than previously supposed, it is now determined by the National Bureau of Standards.

As a result of recent measurements made by R. F. Geller and P. J. Yavorsky of the Bureau staff, the melting point of alumina has been determined as lying within the range 3630 to 3690 degrees Fahrenheit. This is lower than the value usually quoted, 3720 degrees.

A reasonably accurate knowledge of the melting point of this material is important because of its wide industrial uses. Three samples containing over 99.9% of alumina were used in the tests. They were heated in an oxidizing atmosphere in an electric furnace, and the temperatures determined by means of an optical pyrometer.

Science News Letter, March 31, 1945

MEDICINE

Highest Soviet Title Given to Army Surgeon

➤ THE HIGHEST Soviet title, Hero of Socialist Labor, has been given to Academician Justin Janelidze, Lieutenant General of the Red Army Medical Service, according to a report recently received from the Soviet Scientists' Antifascist Committee.

The title was awarded for outstanding services rendered in developing Soviet surgery and in effecting improvements in surgery in naval hospitals and naval medical schools in wartime. Gen. Janelidze is a member of the Academy of Sciences of the USSR and a well-known surgeon who has specialized in surgery of the heart.

Science News Letter, March 31, 1945

BIOLOGY

Glycerin Produced by Action of Bacteria

➤ GLYCERIN has been produced by the action of a strain of bacteria on a glucose solution, in experiments conducted under the auspices of the Division of Applied Biology, National Research Council of Canada. The work is briefly reported in *Science* (Mar. 9), by Prof. A. C. Neish, A. G. Blackwood and Dr. G. A. Ledingham; full details will soon appear in the *Canadian Journal of Research*.

The special bacteria used are known as Ford's strain of *Bacillus subtilis*. The three researchers state that to the best of their knowledge this is the first time any species of bacteria has been shown to yield glycerin through the breakdown of a carbohydrate.

Some years ago, glycerin was produced in Germany by yeast fermentation; but yeasts are quite different organisms from bacteria, though both are microscopic. A somewhat analogous fermentation process, with molds as the active organisms, produced butylene glycol in experiments at the Northern Regional Laboratory of the U. S. Department of Agriculture.

Science News Letter, March 31, 1945

INVENTION

Seagoing Patrol Craft May Use Sail for Cruising

➤ MEMORIES of the historic Wasp and Hornet, and the many other small but swift-sailing and sharp-stinging ships of the early American Navy, are revived in a proposal to put at least a small part of the modern Navy under sail again. This idea is embodied in a design for a seagoing patrol craft that will use sail for ordinary cruising, at an approximately 13-knot speed, but can turn on a powerful internal-combustion engine and charge ahead at 25 knots when a submarine is detected, or some other fighting emergency arises. The designer, A. A. Steele of Los Angeles, has been awarded U. S. patent 2,371,478.

High speed is attained on moderate size through the use of long concavities under the hull, which trap air over which the craft rides. The designer states that on a 96-foot ship of this type a crew of 18 can be carried, with fighting equipment that will include 40-millimeter guns, depth charges and listening devices. Patrolling noiselessly under sail, the craft will not beteray its presence to listening submarines, while it can pick up the throb of the U-boat's diesels or the hum of its motors and be ready to strike before the enemy is aware of its presence.

Science News Letter, March 31, 1945

GENERAL SCIENCE

Franklin Institute Medals To Be Awarded in April

➤ THE BROWN medal of the Franklin Institute will be presented April 18 to Dean Gilmore D. Clarke of Cornell University of Architecture, for outstanding work in town and city planning, and the Clamer medal to Dr. Zay Jeffries of the General Electric Co. for work in the science of metals.

The Howard N. Potts gold medal has been awarded to Edwin A. Link, president of Link Aviation Devices, Inc., Binghamton, N. Y., for valuable contributions in aviation training devices.

The Longstreth medal has been awarded to Sanford L. Cluett of Troy, N. Y., and the Louis E. Levy medal to Dr. Rupen Eksergian, consulting engineer of the Edw. G. Budd Manufacturing Company. Mr. Cluett is honored for the processes developed by him for preshrinking fabrics, known as "Sanforizing", and Dr. Eksergian for a paper on the reaction of fluids and fluid jets.

Science News Letter, March 31, 1945

ASTRONOMY

Springtime Skies Here

High in the south appears the figure of Leo, the lion; Jupiter is the brightest object during most of the evening at the present time.

By JAMES STOKLEY

► WITH the coming of April, the appearance of the evening skies, as well as the weather, attest to the fact that spring has come and winter is left behind. Orion's glorious figure, so dominant in the evening in January, is just glimpsed low in the west. Instead, high in the south, appears the figure of Leo, the lion. To the right in this group is the familiar "sickle," with the blade of that implement forming the lion's head. Joining the stars in Leo, at the present time, is the planet Jupiter, brightest object during most of the evening.

On the accompanying maps are pictured the stars and planets seen on April evenings, about 11:00 p. m., your own kind of war time, at the beginning of April, and about 10:00 p. m. on the 15th. Sirius, the brightest star, is still visible, in the southwest, to the left of Orion. Above it is Canis Minor, the lesser dog, with first magnitude Procyon. Directly west, above Orion, is the constellation of Gemini, the twins. Like Leo, this group also contains a planet—Saturn—which is fainter than Jupiter but brighter than most of the stars. The brightest star in Gemini is Pollux, alongside which is seen Castor, the other twin.

In the southeast, extending downwards to the left from Jupiter, is the group of Virgo, the virgin, and in this is the bright star Spica. Above the eastern end of Virgo is Bootes, of which the star Arcturus is the prominent member.

Capella Prominent

The most prominent star in the northern half of the sky, as the maps show it, is Capella, in Auriga, the charioteer, which is in the northwest, to the right of the foot of Castor, where Saturn is seen. Aldebaran, in Taurus, the bull, is lower, but when it gets as close to the horizon as here depicted the absorption of light by the earth's atmosphere dims its brightness, so it seems only of the second magnitude, whereas it is actually of the first. The same thing is true of Vega, in Lyra, the lyre, which is shown very low in the northeast. But while Aldebaran is now about to disappear from the evening skies entirely, Vega, during the coming months, will be coming into a better position.

Ursa Major, the great bear, of which the dipper is the best known part, is now in its highest position of the year, directly above the pole star, Polaris, to which the pointers are guide posts. The W-shaped figure of Cassiopeia is low in the north. Winding around the little dipper, of which the pole star is part, is the group of Draco, the dragon. Next to the little quadrilateral of stars at the bottom which form the dragon's head is Hercules, the strong man, which, like Vega, will come into better view during the late spring and summer.

In the latter part of the month, the moon will move through some of the constellations shown. New on April 12, a day or two later it will be glimpsed as a narrow crescent low in the west after sunset. By April 15 it will be in the constellation of Taurus. Early in the morning of the 17th, when it is not visible, it will be close to Saturn. First quarter comes on the 19th, when it is in Cancer, the crab. During the following week, in a gibbous phase, it moves through Leo and Virgo, until April 27, the date of full moon, when it stands in the direction of Libra, the scales. During the night of April 22 it will pass Jupiter, at a distance of about 6 lunar diameters.

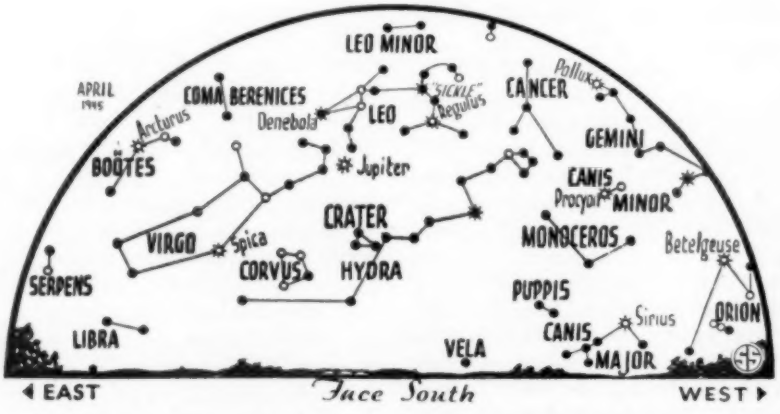
One other planet will be seen at the beginning of the month when Venus is still visible low in the west in the early evening. It is rapidly drawing toward the sun, however, and is nearly in line with it on the 15th. Then, as it passes to the west of the sun, it rises in the east before sunrise and at the end of the month will be visible there as a morning star.

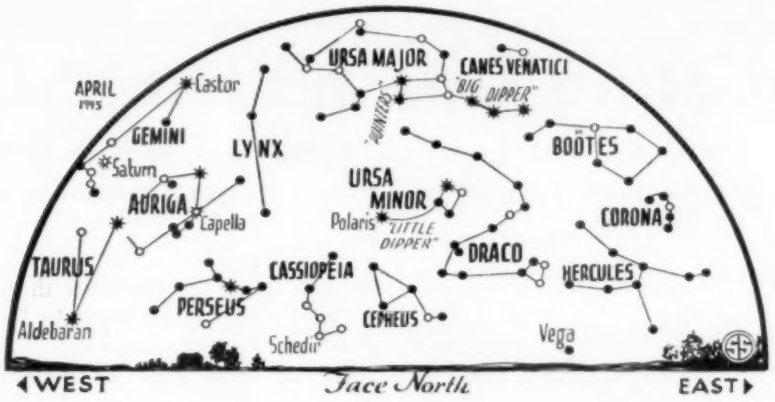
This month, as Venus shifts from evening to morning star, we have an example of something that was very puzzling to the ancients. They saw this planet in both positions, but it was a long time before they realized that it was one and the same. When it was a morning star they called it Phosphorus, while Hesperus was the name given to its evening manifestation.

The same thing was true of Mercury, which at the end of March was visible in the west after sunset, and in May will be a morning star, on the other side of the sun. They called it Mercury when it was in the evening, but Apollo in the morning.

Both Revolve Around Sun

Actually, these planets both revolve around the sun and both move in orbits that are smaller than that of the earth. Every 116 days Mercury comes approximately between the sun and earth at "inferior conjunction." About 22 days before this it is at its greatest distance or "elongation" east of the sun, when it is visible in the evening for a while after sunset. About 22 days after inferior conjunction it is farthest west of the sun—a morning star. Then about 72 days elapse while it swings around behind the sun, again coming to its evening position. Because Mercury is so close to the sun—at a





distance of but 36,000,000 miles—it is only visible when near one or the other elongation.

Venus, on the other hand, is at a mean distance from the sun of 67,000,000 miles, so it is visible over a much larger part of its orbit. Only near its inferior conjunction, which occurs April 15, or the superior conjunction, when it is on the far side of the sun, is it completely invisible. The greatest eastern elongation, such as recently brought it into view in the evening, comes about 72 days before inferior conjunction, and greatest western elongation about the same time afterwards. Then about 440 days elapse while it slowly creeps behind the sun, and again comes into view in the evening. About this time next year it will come into the evening sky once more, gradually brightening until it attains the maximum brilliancy just before Christmas, 1946.

Celestial Time Table for April

Apr.	EWT	
5	3:18 p.m.	Moon in last quarter
9	3:07 p.m.	Moon passes Mars
12	4:00 a.m.	Moon nearest, distance 221,800 miles
	6:54 a.m.	Moon passes Mercury
	8:29 a.m.	New moon
	8:58 a.m.	Moon passes Venus
15	1:00 p.m.	Venus between earth and sun
17	8:52 a.m.	Moon passes Saturn
19	3:46 a.m.	Moon in first quarter
23	1:50 a.m.	Moon passes Jupiter
25	11:00 a.m.	Moon farthest, distance 252,500 miles
27	6:33 p.m.	Full moon

Subtract one hour for CWT, two hours for MWT, and three for PWT.

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AERONAUTICS

World's Largest Airport

➤ WORLD'S largest airport is a B-29 base on Tinian Island in the Pacific, reports P. B. Taylor, acting general manager of Wright Aeronautical Corporation, who recently completed a 25,000-mile journey of key points in the South Pacific theater. Several 8,000-foot runways for the Superfortresses were cut right out of the jungle, and the whole installation completed in eight weeks, he stated.

Tinian, along with Saipan and Guam, now form the principal air bases for attacks on Japan. The shape of the island closely resembles Manhattan. It is about ten miles from north to south and four miles wide at its center. U. S. troops stationed there have named parts of the island for familiar New York City areas, including the Bowery, Broadway, and Columbus Circle.

Unlike airports in the United States which have a number of runways crisscrossing each other so that planes may take off into the wind, and land with the wind, there are no cross strips on the Tinian field. Pilots take the winds as they find them, coming in fast for landings and relying on the steel mats used to surface the runways to stop the plane short, Mr. Taylor pointed out.

When U. S. forces seized Tinian from the Japanese, they found only one landing strip on the heavily fortified island. This landing strip was so inadequate and poorly built that our Army and Navy built the new larger landing strips right over the top of it, he commented.

The climate on Tinian is comparable to that of the Philippines, although the heat is not as intense. It is a low coralline limestone island without prominent elevations.

Tinian is one of the Mariana group that stretches northward from Guam about 550 miles. The group was named in 1688 in honor of Maria Anna of Austria. In 1914, the Japs took all of them except Guam from Germany, who had bought them from Spain in 1889. Japan stole Guam from the United States soon after Pearl Harbor, and held it for about two and a half years.

Science News Letter, March 31, 1945

AERONAUTICS

Huge Steel Propellers In Quantity Production

➤ AMERICA'S largest four-bladed hollow steel propeller is now in quantity production for use on the huge flying boat Mars and army warplanes. The propeller measures 16 feet 8 inches from tip to tip, and is designed to absorb approximately 3,000 horsepower.

The new propeller was developed after three years of joint research by the Army Air Forces Materiel Command and the Curtiss-Wright Corporation.

The new propellers are full-feathering. That means that the blades can be turned to approximately a 90-degree angle of pitch, thereby preventing the propeller from windmilling and causing excessive vibration in the event of engine failure. With motion stopped, it presents a minimum amount of drag.

Science News Letter, March 31, 1945

No *fungicide* is known that arrests fungi in their early stages and prevents them from forming colonies, and is also non-corrosive, non-toxic to humans, permanent and colorless.

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Do You Know?

Insects kill more trees annually than forest fires.

Julius Caesar used army *pigeons* as messengers nearly 2,000 years ago.

Pineapple production in Cuba in 1945 will be some 40% greater than in 1944, it is now estimated.

Very few of the *marine bacteria* plentiful in ocean waters cause diseases in the habitants of the sea and none cause diseases in man.

Rubber-lined iron pipe is used successfully in pumping water from coal mines when the water carries enough sulfur to corrode unprotected metal.

Sand containing calcium chloride is used on icy roads to prevent skidding; 50 pounds of the chemical to a cubic yard of the abrasive is the usual mix.

Spain produces annually approximately 80,000,000 *bottles* of all kinds; one-half are wine bottles and less than 1% milk bottles and fruit jars.

Postwar household *furniture* made of aluminum and magnesium will be so light that the housewife will be able to move it around without the help of her husband.

Diluted *lemon juice* completely loses its vitamin C potency after four days, but oxidation can be prevented by the addition of pyrophosphate so that 16% is present after 30 days.

Birds in perched nests usually are helpless for many days after being hatched, while the young of birds that nest on the ground are able to run and feed soon after hatching.

Airplane *cargoes* have now included a shipment of bees to Alaska, frogs from Argentina to U. S. sugarcane areas, baby chicks to the West Indies, and wasps from Cuba to Mexico to kill the Mexican black fly.

Apples are being stored experimentally under water in a Canadian lake; 200 tons of them are suspended 10 feet below the surface in nets under piers and will be used later for apple by-products if satisfactorily preserved.

MILITARY SCIENCE

Shooting Doesn't Hurt!

With the new frangible bullet, you can be shot at with live ammunition that will pierce armor plate, and you won't be hurt at all.

➤ YOU CAN now experience the feeling of being shot at by a machine gun, having live ammunition that will pierce ordinary armor plate fired at you, and you won't be hurt at all. The secret behind this dramatic experience is a new frangible bullet, that is, a bullet with a slug that is easily broken when it strikes special armor plate.

Developed for the use of Lt. Gen. Barton K. Yount's AAF Training Command, the frangible bullet now permits student gunners to shoot live ammunition from real B-17 and B-24 bombers in the air at specially built target fighter planes. These fighter planes, piloted by ex-combat men, duplicate every known maneuver of enemy fighters in hot aerial sham battles.

The frangible bullet is the result of research done at Duke University by Maj. Cameron Fairchild. It is made from a combination of lead and plastic material, hard enough to withstand being fired through a machine gun and able to pierce ordinary armor plate. But the slug will spatter harmlessly into fine powder, like salt, on contact with duraluminum alloy armor, especially treated, and mounted on target planes, which are a modification of the P-63 "Kingcobra."

Like a drop of water shooting through the air at high velocity, the slug of the frangible bullet disintegrates upon striking the target. Seated in a plane only 1,000 inches away from a standard machine gun, you can be shot at with frangible bullets. They spatter over the wings and even hit the bullet-proof glass windows around the cockpit. You hear only "pops" like those made when a cork is pulled out of a bottle. If you hold your finger up behind the glass, and have a bullet fired point blank at your finger, you only feel a slight sting when it touches the glass.

In practice aerial missions, when student gunners hit the target plane with frangible bullets, a beacon lamp flashes brightly in the nose, where the P-63's gun is usually located, to tell the gunner whether or not he scored a hit. Thus gunners develop the ability to recognize the split-second opportunities they will get later on in real combat to kill an enemy plane.

Right from the start of his training, the gunner gets the feel of the weapons he will use later on. One of the first devices he encounters is the "Spotlight Trainer." A beam of light races along a circular wall, tracing a pattern that represents the speed and movement of an attacking enemy fighter. The trainer's hollow guns contain photoelectric cells. When the student lines up his sights he presses the trigger, exposing the photocell. If he has aimed correctly, the light rays from the spot on the wall register in the cell, and the student's hits are indicated on an automatic sounding and recording device. The average student increases from 350 to 850 hits per thousand shots during this phase of training.

Designed to bridge the gap between theory and actual combat, the Jam Handy trainer gives student gunners the "feel" of air warfare by letting them fire bursts of light instead of bullets at enemy airplanes on a movie screen. The trainer consists of a synthetic gun, two 16-millimeter movie projectors and an ordinary screen. Four gun positions are located in front of a cluster of five synchronized movie projectors. In front of them is a huge concave movie screen. The whole unit is designed to simulate actual flying conditions. Pictures of Jap and Nazi planes are thrown on the screen. The student must accurately compute the relative speed and apparent motion of the attacking plane so as to calculate the proper lead or deflection in placing of his sights in order to score a hit.

Following the training with synthetic devices, student gunners go out to gain practical experience with real guns onto firing ranges where they shoot at stationary and moving targets, and at moving targets when they too are moving on the deck of a truck.

The next step takes them into the air, for sham combat. Finally they graduate and go overseas with knowledge that surpasses that of any enemy gunner, knowledge that will help them to bring the war to a speedier conclusion.

Science News Letter, March 31, 1945

ZOOLOGY

NATURE RAMBLINGS

by Frank Thone

The Early Worm

► ROBINS, when they appear on their northward migration, are universally taken as the first authentic sign of spring. No one can resist robins. They are anything but shy; you always know when they hit town. They are as shoutingly optimistic as Walt Whitman, as cheerfully conspicuous as a convention of Legionnaires or Shriners. They are the go-getters among birds.

What they go-get, in early spring at least, seems to be mostly earthworms. How they spot them nobody seems to know. But you'll see a robin make a few dirt-scattering dabs with his beak, then haul the luckless annelid up and gobble it down. When we see a robin in a tug-of-war with a worm, we all forget the traditional American sympathy for the underdog and root for the robin.

Actually, if we were mindful of our own selfish interests as human beings, we'd be pulling for the worm—maybe even throwing clods at the robin to make him desist from his murderous assault. For earthworms are among the most useful of all wild animals, in terms of their importance to human welfare. The millions of them that inhabit the topsoil of every fertile field make a mass contribution to our agriculture that would be hard to estimate in dollars and cents.

For untold ages, earthworms have been doing for the soil what man has begun to do only with his latest inventions—plow and fertilize it at the same time. They make innumerable burrows, which go to considerable depths. They hide in these during the daytime and reach out of them at night to seize and drag back fragments of leaves for food. The partly digested remains of this material, mixed with earth that has passed through their bodies and deposited as "worm casts" at the mouths of the burrows, are a major factor in enriching the soil with humus. The burrows themselves provide means for soil aeration, help mightily in getting water into the ground that would otherwise be lost as runoff, and make root penetration much easier.

Although robins and other birds do take considerable toll of earthworms, it is to be doubted that their inroads do any real damage to agricultural interests. There are so many worms, and they multiply so rapidly, that these small gaps in their ranks are hardly noticeable. Nevertheless, when we see a worm vanishing down a robin's gullet we might at least spare a sympathetic thought for the poor thing.

Science News Letter, March 31, 1945

Why 109 Kinds of Optical Glass?

Bending light to the will of man, making it accomplish miracles, this is the job that optical glass does.

Creating the required types of glass, and adapting them to the thousands of precision operations they are to perform, is the task of Bausch & Lomb, America's large scale producer of optical glass and the only company currently producing 109 kinds.

Many of these glasses may look alike, but to the optical expert each is different. That difference is marked by specific qualities of refraction, dispersion, and transmission.

Only by having available all of these types of glass . . . and the ability to create new types when needed . . . has Bausch & Lomb been able to meet the optical instrument needs of science and industry in times of peace . . . the needs of our armed forces for highly precise military optical instruments. Bausch & Lomb Optical Co., Rochester 2, New York.

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NUTRITION

Jap Soldier Well Fed

Under most circumstances he eats twice as well as his family at home, getting some meat, fruits, extra vegetables and even candy.

➤ THE JAPANESE soldier eats well, if not by American standards, at least by Japanese standards. Under most circumstances he eats twice as well as his family at home. While the folks at home are managing to live on a diet of rice, fish, and vegetables, the little yellow men of the Mikado's army get some meat, fruits, extra vegetables, and even candy to flavor and vary the staple diet of rice and fish.

The food problem in the Japanese army is a great deal different from our own. There are no company or squadron messes. Each Nip is his own cook, and he usually prepares enough at one time to last him for 24 hours.

There are no well-balanced field rations such as are supplied to our troops. The Jap soldier going into battle carries rice and small hard biscuits. On occasion he carries canned meat. There are two types of packaged field rations, each containing a complete meal. In one type there are cakes of compressed wheat or barley, sugar, cakes of dried fish, and cakes of salty dried plums. The other type contains two cakes of a compressed fish-and-vegetable mixture, looking like our familiar bouillon cube, and a sack of precooked rice flour. The soldier mixes the flour with water to make a doughy substance which he eats cold.

The Nip airmen fare a little better than the ground forces. Aviation rations include such items as dried fish, pickled plums, peas, hard candy, chocolate, whisky, canned pineapple, hardboiled eggs, cider, and cans of meats and vegetables mixed together in a stew or hash.

Water is always a problem for the Japs, since they cannot take the salts out of sea water. On Saipan, the Jap soldiers carried water sausages made of a cellulose sheeting filled with water and tied off into short links. When a Jap got thirsty he just bit into a link. This water sausage was draped around the neck or carried in the pocket.

Blind obedience is drilled into the Jap soldier from the time he starts his training. Before the war a company of Jap soldiers on summer maneuvers received orders not to drink from their canteens until given permission to do so by their commanding officer. About 20 men fell to the ground from thirst and exhaustion and five died. An examination of their canteens revealed that they had not been touched.

Science News Letter, March 31, 1945

HORTICULTURE

Corn From One Planting Available All Season

➤ NEW HYBRIDS of sweetcorn developed during the past season, used in connection with older hybrids, will make it possible for the home gardener from one planting to pluck corn in the pink of condition every day from early summer to frost. These new hybrids were developed by the Connecticut Agricultural Experiment Station, and although not yet thoroughly tested give good promise. One matures earlier than older early hybrids, the other later than the better-known late varieties.

If six varieties of corn, in what is called a succession series by the station, are planted at the same time, mature corn will be available throughout the season. As one passes maturity the next will be ready for the table. The new hybrids are expected to extend the sweetcorn season appreciably. Information on the succession series is available in the annual sweetcorn report of the station.

Science News Letter, March 31, 1945

A synthetic transparent *chemical* has been perfected that absorbs 99.9% of the ultraviolet radiations of the sun for use in plastic goggle lenses.

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• Books of the Week •

➤ JANE'S FIGHTING SHIPS for 1943-44 has just appeared in its American edition—delay in publication is quite understandable, considering present conditions. Data are corrected to July, 1944. It is exceedingly helpful to anyone who tries to keep abreast of the naval war situation to have access to the new information here made available, even though many more changes have taken place in the intervening months. The war loss section has grown to formidable proportions; it is some satisfaction to note, however, the number of enemy ships so listed. (*Macmillan*, $19.)

Science News Letter, March 31, 1945

➤ THREE MORE numbers have been added to the excellent pamphlet texts known as the Bios Classroom Series. They are THE HONEYBEE, by F. C. Pellett; THE OYSTER, by R. V. Truitt, and IN THE BEGINNING: THE ORIGIN OF LIFE, by C. T. Hurst. (*F. G. Brooks*, Mt. Vernon, Iowa, 10 cents each.)

Science News Letter, March 31, 1945

➤ ANTHROPOLOGY has come into its own in the present war; we have come to realize that in order successfully to combat our enemies and cooperate with our friends it is desirable to know all we can about them as human beings. Ralph Linton, one of the best known of American anthropologists, undertakes to bring the special knowledge of his discipline to bear on immediate problems in THE SCIENCE OF MAN IN THE WORLD CRISIS (*Columbia Univ. Press*, $4), a book that should be required reading for every legislator and every conference delegate—not to mention the corps of administrators who will be required to take care of conquered enemy territory.

Science News Letter, March 31, 1945

➤ ZOOLOGISTS around the Upper Great Lakes and the adjacent regions will find a useful field companion in AMPHIBIANS AND REPTILES OF THE CHICAGO AREA, by Clifford H. Pope. The species are not only well described, but details of their life histories not often given in a small book are included, together with excellent sketches of some of the more interesting details. There are many good colored plates. (*Chicago Natural History Museum*, $1.75.)

Science News Letter, March 31, 1945

➤ MEANINGS and derivations of words are always fascinating, and to scientists their exact understanding is often of highest importance. It is gratifying, therefore, to find in Robert S. Woods' THE NATURALIST'S LEXICON an unusually full and complete vocabulary for the life sciences, including large numbers of little-used or obscure terms. (*Abbey Garden Press*, $2.75.)

Science News Letter, March 31, 1945

➤ WILL BEEBE has built up, in many popular books, an excellent reputation as a naturalist who knows how to write. Now, in THE BOOK OF NATURALISTS, he gives us an anthology of the great writing naturalists of the past, from Aristotle and Pliny through Gesner and Linnaeus to Fabre and J. S. Huxley; excellent selections, many of them classics. It is rather a pity that modesty prevented inclusion of anything by William Beebe. (*Knopf*, $3.50.)

Science News Letter, March 31, 1945

➤ QUESTIONS PARENTS ASK and the answers make up an unusual and helpful section of a new book on sex education of children, HOW SHALL I TELL MY CHILD? by Belle S. Mooney (*Cadillac*, $1.98). After getting their own perplexities solved by this section, they will be better able to make use of the section on questions asked by children and the answers. The "dictionary of physiological terms" at the end might be even more useful if pronunciations were given as well as definitions.

Science News Letter, March 31, 1945

• Just Off the Press •

ADSORPTION—C. L. Mantell—*McGraw*, 386 p., illus., $4.50 (Chemical Eng'g Series).

AIRFRAME MATERIALS—F. S. Stewart—*McGraw*, 237 p., illus., $2.50.

BUILDING INSULATION, a Treatise on the Principles and Application of Heat and Sound Insulation for Buildings—Paul Dunham Close—*Am. Tech. Soc.*, 328 p., illus., $3.50, 2nd ed.

THE CONTROL OF COMMUNICABLE DISEASES, an Official Report of the American Public Health Association—*Am. Public Health Assn.*, 147 p., paper, 35c, 6th ed.

DISCOVERY OF THE ELEMENTS—Mary Elvira Weeks—*Journal of Chemical Education*, 578 p., illus., $4.

GERMAN-ENGLISH DICTIONARY OF METALLURGY with Related Material on Ores, Mining and Minerals, Crystallography, Welding, Metal-working, Tools, Metal Products, and Metal Chemistry—T. E. R. Singer—*McGraw*, 298 p., $4.

HEREDITY IN DAIRY CATTLE, Lessons in Breeding and Herd Development for 4H and FFA Dairy Clubs and other Beginners—James E. Russell—*Am. Guernsey Cattle Club*, 135 p., illus., $2.50.

HOW SHALL I TELL MY CHILD?, a Parents' Guide to Sex Education for Children—Belle S. Mooney—*Cadillac Pub. Co.*, 192 p., $1.98.

"HSC" HIGH-SPEED BRAKE EQUIPMENT for Types "A", "B", and "C" Diesel Locomotive Units and Cars with Individual Speed Governor Control—C. M. Drennan—*Am. Tech. Soc.*, 68 p., paper, illus., $3.50.

INTRODUCTION TO MICROWAVES—Simon Ramo—*McGraw*, 138 p., illus., $1.75.

ORGANIC CHEMISTRY with Applications to Pharmacy and Medicine—Eldin V. Lynn—*Lea*, 355 p., illus., $4.50, 2nd ed.

THE PSYCHOLOGY OF DIET AND NUTRITION—Lowell S. Selling and Mary Anna S. Ferraro—*Norton*, 192 p., $2.75.

ROCKETS AND JETS—Herbert S. Zim—*Harcourt*, 326 p., illus., $3.

THE STORY OF THE U. S. ARMY AIR FORCES—Jim Ray—*Garden City Pub. Co., Inc.*, illus., $2.

A STUDY OF SPONTANEOUS MUTATION—Richard B. Goldschmidt—*Univ. of Calif. Press*, 549 p., paper, illus., $3.

TRAMPLING OUT THE VINTAGE—Joseph A. Cocannouer—*Univ. of Okla.*, 221 p., $2.75.

Science News Letter, March 31, 1945

ELECTRONICS

Electronic Vulcanization Of Rubber May Be Common

➤ THE ELECTRONIC vulcanization of rubber may become common in the near future, replacing the familiar heating method, with the securement of the basic patents covering the new process granted on discoveries made by R. A. Dufour and H. A. Leduc of France, and by E. E. W. Kassner of Switzerland. The purchasers of the patents are the B. F. Goodrich Company and the Firestone Tire and Rubber Company, who plan to make them available to other companies in the rubber and plastics industries on a reasonable basis.

Electronic vulcanization will speed production, but, more important, will give more uniform and higher quality products. Vulcanization is the joining of rubber molecules and sulfur. For more than a century, rubber has been vulcanized by applying heat to the outside surface. Since rubber insulates against rather than conducts heat, heating to the core by this method is slow and lacks uniformity. In electronic heating the core is heated quickly. In electronic vulcanization, high-frequency oscillations shake the molecules of rubber and sulfur millions of times a second, creating uniform heat throughout the product being vulcanized in a fraction of the time required when steam heating is used.

Science News Letter, March 31, 1945

Baking soda and water will clean grease effectively from a waffle iron.

NEW "PICK-UP" CANE

Permits Disabled Persons To Pick Up Small Articles Without Painful Stooping.

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· New Machines and Gadgets ·

❁ *THEFT-PROOF billfold, to balk the pickpocket and warn the owner, has a short end made of a stiff material with a bulging friction edging across its top. When inserted properly in the pocket, if the billfold is pulled upward by grasping the top only, the friction edge causes the stiff fold to open and resist withdrawal.*

Science News Letter, March 31, 1945

❁ *MAGNETIC TOOL, for inserting triangular brads used in holding panes of glass in window frames, is a handle with a depressed magnetized forward end. A raised slot on its under surface receives the rear end of a brad and keeps the brad from being pushed too far into the wood.*

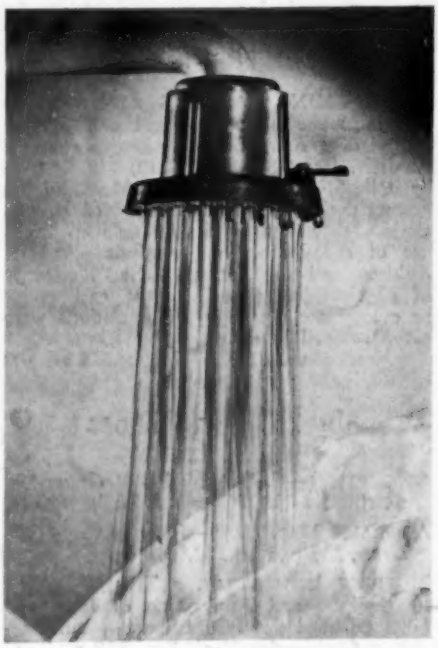
Science News Letter, March 31, 1945

❁ *MILITARY TOOL, usable as a spade, shield, gun rest or wire-cutter, has two complementary half-blades with separate handles. Attached together by a pivot near the blade points, they form a wire-cutting tool when the handles are held apart, and a spade when closed. For other uses the tool is stuck in the ground by pointed ends on the handles.*

Science News Letter, March 31, 1945

❁ *COMBINATION storm and screen door, in reality two separate doors which open outward and may be swung as a unit or separately, depends for operation on a three-way hinge with one door hung on each of the free arms of the hinge. The storm door may be fastened open in warm weather.*

Science News Letter, March 31, 1945



❁ *FAUCET SPRAY of plastic for the kitchen sink delivers a single center stream of water, or a spray suitable for rinsing dishes and washing vegetables. A flick of the finger on a small lever on the side of device, shown in the picture, controls the opening and closing of the center hole.*

Science News Letter, March 31, 1945

❁ *INDUSTRIAL truck auxiliary, for use on factory floors in handling long articles difficult to maneuver in narrow aisles, is a dolley mounted on casters. It can be moved about manually to a limited degree and can also be transported rapidly between departments by the electric truck.*

Science News Letter, March 31, 1945

❁ *SAFETY HEATERS, particularly for laboratory use for heating substances contained in glassware, have electric nickel-chrome heating coils enclosed in an insulated metal housing into which the glass container is put. Heat output, from AC application, may be varied by use of auto-transformer control.*

Science News Letter, March 31, 1945

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N St., N. W., Washington 6, D. C., and ask for Gadget Bulletin 252.

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